



The National Ag Safety Disc: A Database of Agricultural Health, Safety, and Injury Prevention Educational Materials¹

P. Jones, J. Nelson, H. Pirozzoli²

ARTICLE ABSTRACT

To promote the national exchange of health and safety program materials, NIOSH (National Institute of Occupational Safety and Health) has supported development of the National Ag Safety Disc (NASD), a PC-based CDROM, which contains an extensive compendium of educational and information resources targeted to support delivery of programs in county Cooperative Extension Service (CES) offices. The current NASD database, a prototype released in October 1994, contains over 1,000 health and safety publications from 23 states and 3 federal agencies. The publications provide extensive coverage of specific health and safety topics ranging from ATVs to Zoonoses, and a significant number of the documents are available in Spanish as well as English. The collection also covers Occupational Safety and Health Administration (OSHA) Standards pertinent to agricultural producers and information on the EPA Worker Protection Standard. In addition to CES style documents, the NASD database prototype includes a database of abstracts and ordering information covering over 500 videos and a NIOSH bibliographic database of over 500 scientific publications concerned with agricultural health and safety, posters, newspaper articles, and radio scripts. Information in the database generally can be accessed on-screen and/or printed on demand. Materials are categorized into topical, organizational, and state menus. In addition to the menus, users can find

specific information by full-text search. After beta testing, the database will be refined and a first edition, '95 NASD, will be released in June 1995.

Keywords. Database, Safety, Educational materials.

INTRODUCTION

In his 1982 book, *Megatrends*, John Naisbett said, "we are currently drowning in information, but we are starved for knowledge". Certainly, as Naisbett's statement implies, one highly visible characteristic of human activity in the late 20th century is the sheer volume and extraordinary range of information persistently present in people's daily lives. It is equally apparent that people seem to need ever-increasing access to specific, accurate information. The dilemma is how to efficiently sift through all of the unwanted information to access precisely what we need.

Naisbett's observation certainly rings true in the safety and health area. As just one example, in 1983 (the year following publication of *Megatrends*) the Occupational Safety and Health Administration (OSHA) promulgated the *Hazard Communication Standard (HCS)* (29 CFR 1910.1200) and applied it to the manufacturing industry. As the Standard was implemented over the next decade, most employers were overwhelmed to some degree by the scope of their information management

1. This document was extracted from the Journal of Ag Safety and Health (Volume 1, Number 1, February 1995) and was submitted for publication in July 1994; reviewed and approved for publication in October 1994. Contribution by the Institute of Food and Agricultural Sciences, University of Florida. Journal Series No. R-04308. Mention of a commercial product does not imply endorsement by the University of Florida, references are provided only for informational purposes.
2. Pierce Jones, ASAE Member Engineer, Associate Professor, Jeff Nelson, Senior Database Coordinator, and Heather Pirozzoli, ASAE Student Member, Graduate Assistant in Agricultural Operations Management, Agricultural Engineering Dept., University of Florida, Gainesville.

The Journal of Ag Safety and Health is an interdisciplinary, refereed journal designed to foster identification and discussion of the issues of agricultural safety and health. The American Society of Agricultural Engineers is not responsible for statements and opinions advanced in its meetings or printed in its publications; they represent the views of the individuals to whom they are credited and are not binding on the society as a whole.

task, especially with respect to material safety data sheets (MSDSs) (Lindsay, 1994). In spite of their efforts to comply with the HCS, most employers (and employees) did not feel a commensurate increase in their access to the specific, accurate information that they actually needed (Hansen, 1994).

In agricultural safety and health, the same trend toward increasing volumes of information with a corresponding increase in the difficulty of finding relevant, accurate and specific information is occurring. For example, in 1987 OSHA's HCS was extended to cover agricultural workers, and beginning in 1995 the full Environmental Protection Agency's (EPA) *Worker Protection Standard (WPS)* will also cover agricultural workers; and the information is not simple. Since many of the regulations in these two Standards overlap, the need to explain the rules and their combined implementation will almost certainly create a new area of regulatory knowledge essential for agricultural safety specialists to master, so they can incorporate the information into their programming activities. Aside from regulatory topics, awareness of an increasing array of agricultural safety and health risks (NIOSH, 1993a, b, c; 1994) requires agricultural safety specialists to respond to a steadily widening area of responsibility.

As a corollary to the increasing scope of expertise required of agricultural safety specialists, an increasing flow of agricultural safety and health information (and programming materials) covering many of these topics is currently coming from state Cooperative Extension Services (CES). Specifically, the current flow of materials being produced by state CES programs is higher than normal as a result of five years of National Institute of Occupational Safety and Health (NIOSH) funding targeted at agriculture (Myers, 1994). In particular, NIOSH's Agricultural Health Promotion System (AHPS) grant program provided approximately \$10 million over the last five years to 18 state CES programs specifically to develop and implement intervention programs. The result is the current accelerated flow of extension-style documents, videos, slide programs, computer-assisted modules, and public service announcement radio scripts into state programs.

The CES is a key organization in the distribution of health and safety information to the agricultural community. Each state's CES is basically autonomous, producing publications and developing educational programs to meet the specific needs of its citizens (ECOP/NASULGC, 1990). Within the national CES system, information exchange between individual states is encouraged and publications from one state are

occasionally reviewed and adapted for use in other states, sometimes with no changes at all. In theory, this seems like a sensible means of minimizing redundancy while insuring that materials are pertinent to each state's unique, local conditions. In practice however, state specialists seldom have convenient access to most materials available from other states (Andre, 1990; Hypes and Miller, 1993), so they rely on familiar materials. The net result is an array of more or less isolated programs with a minimum of nationally coherent elements. This lack of coordination among state programs can become a significant problem under circumstances such as the flooding of the Midwest during 1993 (Reynolds et al., 1993). The isolation of state programs is especially apparent in relatively small programmatic areas like agricultural safety and health.

Unfortunately, the combination of an increasing volume of agricultural health and safety information and semi-permeable barriers between state CES programs is not a configuration likely to maximize the useful impact of the AHPS program (Myers, 1994). The purpose of this article is to describe a project that addresses this problem and attempts to increase the national impact of individually developed state CES health and safety programs.

BACKGROUND: "A POSSIBLE SOLUTION"

About 12 years ago the Florida CES initiated development of a centralized electronic information delivery system. The original system, called the Florida Agricultural Information Retrieval System (FAIRS), was a videotext-style database delivered to county CES offices around Florida via modem links to a mainframe computer located on the University of Florida campus in Gainesville, Florida (Johnson and Beck, 1986). Early on, FAIRS seemed to offer a means to expedite the transfer of information from extension specialists to extension agents by avoiding many of the delays, costs, and inventory issues associated with traditional print publications. In terms of effective information delivery, this early effort was not successful, but it did serve as a vehicle for exposing a new class of issues and problems associated with electronic delivery of information.

In the early to mid-1980s, extension specialists were willing to put their materials into the videotext FAIRS system, but they soon discovered that putting the information into the electronic database did not mean that they could abandon their print documents. In effect, they had to develop two versions of the same material—a text only version for the videotext database (graphs, images, and equations were not supported) and

a traditional print version. This became known as the "too many versions" problem (Jones, 1992). Furthermore, once their materials were included in the videotext database, they had to be independently maintained along with their traditional print versions. So, each time a revision was made in one information product it was supposed to be made in the other. Because revision cycles were not coordinated, a "version control" problem developed (Jones, 1992).

Like the specialists, extension agents were initially willing to give the system a try, but they soon discovered that the mainframe computer interface was difficult to learn and use, and that the system was slow. The problem grew worse as computer use on campus increased. County office access was restricted to once a day with a 15-min time limit and automatic log-off. Not surprisingly, this policy discouraged extension agents from accessing the system and utilizing the FAIRS databases (Larry Halsey, personal communication, 1986). For these reasons, Florida's centralized electronic information delivery system fell into a static state of performance by the mid-1980s and had relatively few users.

In 1987, a group of extension specialists began working on a PC-based electronic information delivery system using CD-ROM as the delivery media. Initial efforts were aimed at delivering digitized images and text files, and using menus, hyperlinks, and full-text searches for retrieval. By the spring of 1989, the group had produced its second CD-ROM (Disc2) and presented it in a day-long workshop to a group of 40 extension agents and specialists for their evaluation of its potential usefulness.

Both the agents and specialists in the workshop were excited about the product. Based on the response to the Disc2 workshop, the extension dean formalized an ad hoc CD-ROM implementation group, giving it responsibility for the FAIRS project (along with the FAIRS budget) in 1990 and requested that another CD-ROM disc be produced (Disc3) for distribution to county CES offices. During the next two years at least one PC equipped with a CD-ROM drive and a laser printer was installed in each of Florida's 67 county CES offices. By the end of 1993 there were over 400 CD-ROM systems installed throughout Florida's CES system, FAIRS had released its eighth disc and a stable, engaged base of users was established (Beck et al., 1994).

To avoid the problems of "too many versions" and "version control" described above, software and document format standards were developed for preparing

large numbers of tagged, electronic extension document files in WordPerfect# (Jones, 1990; Cilley et al., 1992). The document files could then be used both to generate a printed document and as input (through automatic software conversion) into the electronic database. This meant that specialists only had to produce and maintain a single version of a publication, but that it could be delivered both as a traditional print publication and electronically on a PC.

Extension agents soon realized another version control advantage, since the system encourages printing publications on demand—the need to store out-of-date printed publications while waiting for updated versions was eliminated. Certain groups of agents came to another realization—some topical areas were well supported, and others were not. Not surprisingly, the agents that found more extensive collections of materials on the FAIRS discs that supported their program became regular users. This led to the concept of "critical mass", which became the central strategic principle guiding development of FAIRS databases. Simply stated, databases must be sufficiently robust that users feel likely to find what they need every time they go to the database. For an electronic information system to succeed, users must have a clear idea of what to reasonably expect from the database (Ruppert, 1992).

Another requirement of an effective electronic information system is that it provide reasonably easy-to-use tools for searching the database. The FAIRS system supports a point-and-click interface used with topical menus, hyperlinks, and full-text search to help users navigate through the system. A final requirement for success is that once information is found it needs to be in a useful form. It is for this reason that all of the materials on the FAIRS CDROMs are available both on-screen and print-on-demand. In addition, the source files of the materials are also provided (as WordPerfect files). Extension agents often need specific pieces of documents for use in newspaper articles or newsletters and having the source files makes access very convenient.

Disc8 (a two volume set) was distributed in October 1993 and contained about 2,500 extension publications archived and formatted for print-on-demand delivery as well as on-screen display. There were five areas that were sufficiently complete and targeted at specific programs that agents with responsibilities in those program areas began to rely on the FAIRS system as a primary programming tool. Because of support provided by a NIOSH AHPS grant, Florida's Ag Safety database became one that reached critical mass. On Disc8, the FAIRS CD-ROM released in October 1993, there were

over 300 safety publications from 9 states, all reviewed and approved for distribution to Florida's county CES offices by the state extension safety specialist.

While demonstrating this database of materials at several meetings of AHPS grantees, the idea of a national collection of extension safety programming materials began to develop. Beginning in October 1993, funding was provided to initiate development of a prototype. To promote the national exchange of health and safety program materials within CES and allied organizations, NIOSH, under the auspices of the AHPS program, is supporting development of the National Ag Safety Disc (NASD), which will contain an extensive compendium of educational and information resources primarily targeted to support delivery of programs in county CES offices. Although the grant supporting this work specifically identifies CES as the primary target audience, other organizations concerned with agricultural safety and health will also have full access to the NASD database.

THE PROTOTYPE NASD DATABASE

The NASD database is intended to be a central repository of instructional and reference resources related to agricultural health and safety programming. The database includes extension-style print publications, verbatim portions of federal regulatory standards, abstracts of scientific publications, a video database, a national resource directory, and several other types of products. All of the NASD print materials are available print-on-demand documents and most can be accessed directly on-screen.

Extension publications form the foundation of the database. The prototype NASD database (released in October 1994) contains over 1,000 health and safety publications from 23 state CES programs. In addition to CES publications, the database includes collections of publications from several other organizations, most notably from California's Occupational Health Nurse in Agricultural Communities project, NIOSH, OSHA, and EPA. A significant number of the documents are available in Spanish as well as English. In particular Arizona, California, and New Jersey contributed over 100 documents available in both languages. The publications collection covers specific health and safety topics pertinent to agriculture and rural America ranging from all terrain vehicles (ATVs) to Zoonoses.

Federal Regulatory Standards pertinent to agriculture are included verbatim. On the NASD prototype the verbatim standards are not generally available on-screen

but only as print-on-demand documents. However, the verbatim standards are provided in conjunction with extension-style publications accessible on-screen that explain and abstract the pertinent OSHA and EPA Standards. The verbatim standards are provided print-on-demand in case a user wants more detail than is provided in the on-screen abstract. In particular, the collection includes 60 selected OSHA 1910 and 1928 standards and the proposed amendments to the EPA Worker Protection Standard current as of summer 1994.

Scientific abstracts are included from the NIOSH Epidemiology of Farm Related Injuries: Bibliography with Abstracts database that includes entries from 535 scientific publications. Each bibliographic citation can be searched using title, author, or abstract words.

Safety video abstracts are included in a NASD database that currently covers nearly 600 videos pertinent to agriculture and rural America including Penn State's Agricultural Accidents and Rescue series (12), Florida's Working Safe in Agriculture series (12), and the John Deere Consolidated Video covering 11 safety topics, as well as 5 other videos from John Deere, Inc. Ordering information is included with each abstract. As with the scientific abstracts, the database can be searched using title, author, distributor, and abstract words.

Public Service Announcement (PSA) scripts from California and Iowa cover topics from child safety seats to ROPS and many are available in Spanish as well as English. There are about 30 total scripts that range in length from 30 s to 5 min. The scripts are available on-screen and print-on-demand. As with most other products on the disc, WordPerfect files are available to facilitate editing the scripts as needed to meet local requirements.

Newspaper articles covering generic topics such as drive shaft accidents and heat stress are included in a database. There are articles from Tennessee, Iowa, and California. The articles range in length from 100 to about 600 words and are available on-screen and print-on-demand. As with the PSAs, WordPerfect files are available to facilitate editing the articles as needed to reflect local conditions and events.

National resource directory materials are organized into a NASD database that includes people and organizations pertinent to agricultural health and safety issues. For example, the database includes listings of extension safety specialists, Farm Bureau safety personnel, and pesticide agencies for each state and it includes regional and national EPA, OSHA, and NIOSH offices and personnel. The database includes names,

addresses, phone numbers, fax numbers, and e-mail addresses where available.

To find materials of interest, users will be able to search the database quickly and easily using the retrieval software's hierarchical menus, full-text search tools, and hyperlinks. Users can access materials through three different menu structures: an "organizational" menu that groups documents by state or federal agency, a topical menu, and a menu organized by media type. Once information of interest is found, users will be able to access the material either on-screen or print-on-demand in most cases or they can retrieve the WordPerfect file and modify it to meet their needs. Some collections of materials (such as the AgSafe project from California and Tommy's Troubles from Kentucky) include graphic images that can be printed as traditional print publications, printed on transparencies for overhead presentation, or presented as "slide shows" directly from the computer with a projection panel.

DATABASE EVALUATION AND DISTRIBUTION

By putting the NASD database in the hands of agricultural safety and health specialists, NIOSH expects to promote greater national exchange of materials and consequently, to enhance agricultural safety and health programming within CES and allied organizations. As with any new product, it is important to familiarize the intended audience with the product. For this product, state CES safety specialists make up the primary target audience. To introduce the NASD database to the target audience, it will be demonstrated at several national conferences and evaluations will be conducted.

Preview Presentations

The prototype NASD database was previewed first by a national audience of agricultural safety specialists in August 1994 at a NIOSH-sponsored conference in Columbus, Ohio: "Agricultural Safety and Health: Detection, Prevention, and Interaction". Two more preview presentations were made during October 1994, in Charleston, South Carolina, at the Southern Agromedicine Consortium meeting and in San Diego, California, at the National Institute for Farm Safety fall meeting. At each of these meetings, general and one-on-one presentations were used with questionnaires to continue identifying resource materials suitable for inclusion in the database and to prioritize the types of materials and media most useful in safety programming.

Limited Prototype Release

Another purpose of the preview presentations and evaluations will be to identify safety specialists with sufficient enthusiasm and interest to serve as an initial test group (beta-testers) for the NASD prototype. Following the last preview presentation in October, there will be a limited prototype release to the identified beta-testers. They will provide a procedural review of the system with respect to installation, documentation, and support issues, then an initial "field" evaluation of the database both in terms of the materials included in the database and type of media supported.

Evaluation and Review Workshop

In March 1995, a two-day evaluation and review workshop will be held in Florida to allow the beta-testers an opportunity to shape the final structure and content of the first edition of the database, '95 NASD, intended for wide distribution. A second purpose of the workshop will be to develop review guidelines and undertake an initial substantive national review of the materials included in the database. Presumably, the review will address issues such as timeliness of the materials (especially with respect to regulatory information), lack of commercial endorsement, and general quality of the information in the database. A national review will be important to facilitate distribution of the disc from NIOSH to various state Cooperative Extension Services.

General Release of '95 NASD

The database will be refined according to the recommendations developed at the evaluation and review workshop. General release of the '95 NASD database is tentatively scheduled for June 1995 at the National Institute for Farm Safety summer meeting in Saratoga, New York.

STRATEGIC CONSIDERATIONS

Release of the '95 NASD will complete Florida's current obligations to the NIOSH AHPS program. At one extreme it may represent an interesting demonstration project that ends up on the shelf, and at the other it may be the first of many "editions" of a national electronic compendium of agricultural health and safety educational and instructional materials. If this system is to go beyond '95 NASD, strategic planning will be required in many areas. One important consideration is technology—how will rapid technological advances affect the database? More to the point, will it quickly become obsolete? Another even more important consideration is the quality

of the database itself. What qualities will allow it to develop and become an essential tool for agricultural safety specialists?

Electronic Media Issues

The materials in the '95 NASD database are, for the most part, prepared in a standard electronic file format. During the preparation procedure, a document's structure is marked with "tags" that specify titles, authors, section headings, tables, figures, and so forth. It is the existence of these tags that allow for the automated processing of a document file into a version for printing and a version for on-screen display on a PC. The tagging scheme used to prepare documents included in the database is based on the Standard Generalized Markup Language (SGML) (Bryan, 1988). These SGML "tags" are of strategic importance because they can be used to port the database to other delivery systems.

In early 1993, NCSA (National Center for Supercomputing Applications) introduced Mosaic, an Internet-based, global, hypermedia system that supports graphics and allows users to retrieve, display, and print documents and data from anywhere on the Internet. Mosaic has an easy point-and-click hypermedia interface and supports the transfer of new media such as sound and video over the Internet. Because Mosaic supports graphics, the FAIRS group has developed and tested software for converting "tagged" documents into HTML (HyperText Markup Language), an SGML DTD (Document Type Definition) used by Mosaic (Hughes, 1994).

While Mosaic is a significant improvement over other interfaces on the Internet, it shares one limitation currently common to all network information delivery systems, slow data throughput (i.e., how long it takes to transfer the information from the central database to the PC). For most PC users who have some sort of network connection, throughput is adequate for character-based information (i.e., text), but inadequate for graphics (as well as sound and certainly video). Although this problem will be resolved in the future, it is presently limiting. So, for the near term, CD-ROM is likely to remain the most flexible, effective, and cost efficient way to distribute the types of information and software capabilities included on the '95 NASD. In the future, however, the means of distribution will need to be re-evaluated in consultation with the users of the database.

Database Integrity

In the short run, distribution of '95 NASD will meet the goals of NIOSH's AHPS program to enhance agricultural health and safety programming within CES. However, in the long run a database will deteriorate if it is not maintained: the collection needs to be regularly reviewed, materials that are out of date need to be revised or deleted, and newly developed materials need to be formatted, cataloged, and added to the collection.

To maintain its value to agricultural safety specialists, the database will need to meet several criteria. First, the database will quickly need to achieve "critical mass"; it must become sufficiently robust that specialists can regularly find the information that they need. Second, a review process needs to be implemented to insure a high standard of substantive quality control. Third, the database must be updated and distributed on a regular basis to encourage older versions of the database to be taken out of circulation. Finally, the extent of the database needs to be evaluated with respect to proprietary materials (such as ASAE Standards). All of the materials currently included in the '95 NASD database are public domain information products. If proprietary materials need to be included in the database in order to achieve critical mass, then mechanisms may need to be developed to merge public and private information to complete the product.

In general, long-term commitment to a database requires that two groups of people agree on the importance and value of the product: the contributors of materials and the users of the database. For the '95 NASD database, state CES safety specialists make up both groups. They are the primary target audience of users and they are the primary contributors to the database. It is this community that will decide whether the '95 NASD database is sufficiently valuable to earn their support.

ACKNOWLEDGMENTS AND REFERENCES

The authors want to thank Drs. Rick Niemeier and David Hard and their staff associates from the National Institute of Occupational Safety and Health for their enthusiastic and effective support of the National Ag Safety Disc project.

References

- Andre, P. Q. J. 1990. In the Field of Agriculture, CD-ROM Delivers! CD-ROM EndUser. Helgerson Associates Inc. Falls Church, Va. 2(3):26-27.
- Beck, H. B., P. H. Jones and D. G. Watson. 1994. A CD-ROM-based agricultural information retrieval system. *Applied Engineering in Agriculture* 10(1):127-132.
- Bryan, M. 1988. *SGML: An Author's Guide to the Standard Generalized Markup Language*. Reading, Mass.: Addison-Wesley Publishing Co.
- Cilley, M. L., P. Jones, D. G. Watson, F. S. Zazueta and H. W. Beck. 1992. Using WordPerfect to implement SGML. In *CD-ROM: Facilitating Electronic Publishing*, ed. L. Helgerson. New York: Van Nostrand Reinhold.
- ECOP/NASULGC (Extension Committee on Organization and Policy/National Association for State Universities and Land Grant Colleges). 1990. Strategic Directions of the Cooperative Extension Service, Univ. of Minnesota, St. Paul, Minn.
- Hansen, M. D. 1994. Environmental Safety and Health Compliance in the 1990s: Using technology to manage the paper chase. *Professional Safety* 39(2):29-32.
- Hughes, K. 1994. Entering the world-wide web: A guide to cyberspace. Enterprise Integration Technologies. 'http://www.eit.com/web/www.guide'
- Hypes, T. M. and M. G. Miller. 1993. Worth it's weight in silver . . . the national CD-ROM sampler: An extension reference library. *J. of Agric. and Food Info.* 1(1):69-85
- Johnson, F. A. and H. W. Beck. 1986. The design and use of the Florida Agricultural Information Retrieval System (FAIRS). In *Proc. of the Int. Conf. on Computers in Agric. Ext. Programs*. Orlando, Fla.
- Jones, P. 1990. Producing a CD-ROM: Preparation of extension documents. *CD-ROM EndUser.* 2:(3):14-16.
- . 1992. Information management: Publishing agricultural databases on CD-ROMs. In *Proc. Advanced Computer Applications in Animal Agric.* Dallas, Tex. Dept. of Animal Science, Cornell Univ., Ithaca, N.Y.
- Lindsay, R. 1994. Getting a handle on MSDS records. *Industrial Hygiene News* 17(4).
- Myers, M. 1994. Needs and challenges in agricultural safety and health: NIOSH's role today and in the future. In *Proc. of the Nat. Inst. of Farm Safety Meeting*. Bloomington, Ill.
- Naisbett, J. 1982. *Megatrends*. New York: Warner.
- NIOSH. 1993a. NIOSH reports on the preventability of tractor rollovers. UPDATE. NIOSH Pubs. No. 93-119. Cincinnati, Ohio.
- . 1993b. NIOSH warns farmers of deadly risks of grain suffocation. UPDATE. NIOSH Pubs. No. 93-116. Cincinnati, Ohio.
- . 1993c. NIOSH warns: Manure pits continue to claim lives. UPDATE. NIOSH Pubs. No. 93-114. Cincinnati, Ohio.
- . 1994. Preventing organic dust toxic syndrome. ALERT. NIOSH Publications No. 94-102. Cincinnati, Ohio.
- Reynolds, S. J., J. A. Merchant, G. Olson, J. A. Sessions and L. Walkner, eds. 1993. *Farm Flood Response Workshop: Implications for Agricultural Health and Safety – Workshop Proc. and Recommendations*. CADIREP Dept. of Preventative Medicine, Univ. of Iowa, Iowa City, Iowa.
- Ruppert, K. C. 1992. Factors affecting the utilization of computers by county extension agents in Florida. Ph.D. diss., Univ. of Florida, Gainesville.